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In re Patent Application of:  
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Examiner: Peter V. Agustin

Application No.: 09/985,783

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For: INFORMATION RECORDING AND  
REPRODUCING SYSTEM ENABLING A  
SELECTION OF WHETHER OR NOT TO  
PERFORM AN INTERRUPTION AND  
RESUMPTION OF A DATA-RECORDING

**SUBMISSION OF TRANSLATION OF PRIORITY APPLICATION IN ENGLISH**

Commissioner for Patents  
P.O. Box 1450  
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Dear Sir:

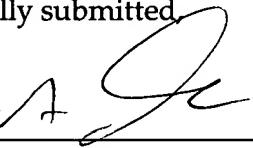
The Submission of Translation of Priority Application Translation in English is submitted in response to the Office Action dated August 26, 2004. Applicant claimed foreign priority under 35 U.S.C. § 119 based on the following prior foreign application, filed in the following foreign country on the date indicated below:

Country	Application No.	Date
Japan	2000-350819	November 17, 2000

A certified copy of the original foreign application was filed on November 6, 2001. Please find enclosed a translation of priority application in English. The Applicant also declares that the enclosed English language translation is a correct, true, and faithful translation of Japanese Patent application no.: 2000-350819. A copy of the declaration is being filed concurrently herewith. The Examiner's approval is solicited.

Dated: November 10, 2004

Respectfully submitted,

By 

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I, Tadahiko Itoh, a Patent Attorney of Tokyo, Japan having my office at 32nd Floor, Yebisu Garden Place Tower, 20-3 Ebisu 4-Chome, Shibuya-Ku, Tokyo 150-6032, Japan do solemnly and sincerely declare that I am the translator of the attached English language translation and certify that the attached English language translation is a correct, true and faithful translation of Japanese Patent Application No. 2000-350819 to the best of my knowledge and belief.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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This is to certify that the annexed is a true copy  
of the following application as filed with this office.

Date of Application: November 17, 2000

Application Number: Japanese Patent Application  
No. 2000-350819

Applicant(s): RICOH COMPANY, LTD.

September 6, 2001

Commissioner,  
Patent Office

Kouzo Oikawa (Seal)

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【Name of Document】

Specification

【Name of Invention】

Information recording and reproducing system

【Claims】

【claim 1】

An information recording and reproducing system comprising:  
a host device; and

an information recording and reproducing device connected with said host device via a host interface, the information recording and reproducing device including a data-recording interrupting-resuming unit that performs a recording of data transferred from said host device via said host interface on a recording medium at a predetermined data-writing velocity, and, in a case of having interrupted said recording, resumes said recording by linking an end point of said data upon the interruption with a start point of said data upon the resumption so as to maintain a continuity of said data,

wherein said host device includes a control-command issuing unit issuing a control command to said information recording and reproducing device, the control command causing said data-recording interrupting-resuming unit either to perform the interruption and resumption of the recording or not to perform the interruption and resumption of the recording, and

said information recording and reproducing device includes a data-recording interruption-resumption control unit controlling said data-recording interrupting-resuming unit either to perform the interruption and resumption of the recording or not to perform the interruption and resumption of the recording, according to said control command received from said host device via said host interface.

【claim 2】

The information recording and reproducing system as claimed in claim 1,

further comprising a selection inputting unit supplying said control-command issuing unit with an arbitrary selection that causes said control-command issuing unit to issue either of a control command causing said data-recording interrupting-resuming unit to perform the interruption and resumption of the recording, and a control command causing said data-recording interrupting-resuming unit not to perform the interruption and resumption of the recording.

【claim 3】

The information recording and reproducing system as claimed in

claim 2,

wherein said host device further includes:

a test-writing unit causing said information recording and reproducing device to perform a test-writing to said recording medium at a predetermined writing velocity;

an interruption-probability judging unit making a judgment on whether or not there is a probability of the interruption during a recording of data to said recording medium, according to a result of said test-writing performed by said test-writing unit;

an interruption-probability judgment-result outputting unit outputting a result of said judgment judged by said interruption-probability judging unit; and

a selection-inputting function control unit enabling said selection via said selection inputting unit, after said interruption-probability judgment-result outputting unit outputs said result of said judgment.

**【claim 4】**

The information recording and reproducing system as claimed in claim 3,

wherein said interruption-probability judging unit further includes a selection-information creating unit creating appropriate selection information based on conditions including a data capacity to be written to said recording medium, when said interruption-probability judging unit judges that there is a probability of the interruption during a recording of data to said recording medium, the selection information being used to perform the recording without the interruption, and

said interruption-probability judgment-result outputting unit further includes a selection-information outputting unit outputting said selection information along with said result of said judgment.

**【claim 5】**

The information recording and reproducing system as claimed in claim 3,

wherein said interruption-probability judging unit further includes a data-writing interruption-frequency estimating unit estimating a data-writing interruption frequency during a recording of data to said recording medium, based on conditions including a data capacity to be written to said recording medium, and a data transfer rate to said information recording and reproducing device, when said interruption-probability judging unit judges that there is a

probability of the interruption during the recording of the data to said recording medium, and

    said interruption-probability judgment-result outputting unit further includes a data-writing interruption-frequency outputting unit outputting said data-writing interruption frequency along with said result of said judgment.

**【claim 6】**

    The information recording and reproducing system as claimed in claim 5,

    wherein said interruption-probability judging unit further includes a relation estimating unit estimating a relation between said data-writing interruption frequency and said writing velocity,

    said interruption-probability judgment-result outputting unit further includes a relation-information outputting unit outputting relation information indicating said relation, and

    said selection-inputting function control unit further includes a writing-velocity selecting unit enabling a setting of said writing velocity and said selection via said selection inputting unit, according to said relation information output by said relation-information outputting unit.

**【Detail description of Invention】**

**【0001】**

**【Field of Invention】**

    The present invention generally relates to an information recording and reproducing system, and more particularly, to an information recording and reproducing system formed by a host device (a host computer), such as a personal computer, and an information recording and reproducing device, such as an optical disk drive device.

**【0002】**

**【Related Art】**

    Recently, in a field of an optical disk recording and reproducing system, for example, in a field of a recordable/rewritable CD, there has been a technical issue concerning an error resulting from an interruption in transferring write data (hereinafter referred to as a buffer underrun).

    Thereupon, for the purpose of eliminating an abnormal end of data-writing due to the above-mentioned buffer underrun, there have been proposed information recording and reproducing devices, such as an optical disk device that resumes a data-writing by linking an end point of write data upon interruption with a start point of the write

data upon resumption so as to maintain a continuity of the write data, in a case of interrupting a data-writing from a host computer (for example, in Japanese Laid-Open Patent Application No. 10-49990 and Japanese Laid-Open Patent Application No. 2000-40302).

### 【0003】

#### 【Problems to be solved】

As described above, when a buffer-underrun error occurs, the conventional information recording and reproducing devices avoid an abnormal end of a data writing by interrupting and resuming a recording. However, the recording quality of data recorded on a recording medium with the interruption and the resumption does not necessarily excel a recording quality of data recorded on a recording medium without interruption; therefore, a user may possibly become unable to have a data-writing be performed with a high quality.

It is a general object of the present invention is to provide an information recording and reproducing system which can perform a data-writing with priority being placed on a recording quality of data to be recorded on a recording medium, according to a user's preference.

### 【0004】

#### 【Means for solving the Problems】

In order to achieve the above-mentioned objects, there is provided according to one aspect of the present invention as follows:

An information recording and reproducing system comprising:  
a host device; and

an information recording and reproducing device connected with said host device via a host interface, the information recording and reproducing device including a data-recording interrupting-resuming unit that performs a recording of data transferred from said host device via said host interface on a recording medium at a predetermined data-writing velocity, and, in a case of having interrupted said recording, resumes said recording by linking an end point of said data upon the interruption with a start point of said data upon the resumption so as to maintain a continuity of said data,

wherein said host device includes a control-command issuing unit issuing a control command to said information recording and reproducing device, the control command causing said data-recording interrupting-resuming unit either to perform the interruption and resumption of the recording or not to perform the interruption and resumption of the recording, and

said information recording and reproducing device includes a

data-recording interruption-resumption control unit controlling said data-recording interrupting-resuming unit either to perform the interruption and resumption of the recording or not to perform the interruption and resumption of the recording, according to said control command received from said host device via said host interface.

#### **【0005】**

Additionally, the information recording and reproducing system according to the present invention, the system may further comprising a selection inputting unit supplying said control-command issuing unit with an arbitrary selection that causes said control-command issuing unit to issue either of a control command causing said data-recording interrupting-resuming unit to perform the interruption and resumption of the recording, and a control command causing said data-recording interrupting-resuming unit not to perform the interruption and resumption of the recording.

#### **【0006】**

Additionally, in the information recording and reproducing system according to the present invention, said host device further includes:

a test-writing unit causing said information recording and reproducing device to perform a test-writing to said recording medium at a predetermined writing velocity;

an interruption-probability judging unit making a judgment on whether or not there is a probability of the interruption during a recording of data to said recording medium, according to a result of said test-writing performed by said test-writing unit;

an interruption-probability judgment-result outputting unit outputting a result of said judgment judged by said interruption-probability judging unit; and

a selection-inputting function control unit enabling said selection via said selection inputting unit, after said interruption-probability judgment-result outputting unit outputs said result of said judgment.

#### **【0007】**

Additionally, in the information recording and reproducing system according to the present invention, said interruption-probability judging unit further includes a selection-information creating unit creating appropriate selection information based on conditions including a data capacity to be written

to said recording medium, when said interruption-probability judging unit judges that there is a probability of the interruption during a recording of data to said recording medium, the selection information being used to perform the recording without the interruption, and

    said interruption-probability judgment-result outputting unit further includes a selection-information outputting unit outputting said selection information along with said result of said judgment.

#### **【0008】**

    Additionally, in the information recording and reproducing system according to the present invention, said interruption-probability judging unit further includes a data-writing interruption-frequency estimating unit estimating a data-writing interruption frequency during a recording of data to said recording medium, based on conditions including a data capacity to be written to said recording medium, and a data transfer rate to said information recording and reproducing device, when said interruption-probability judging unit judges that there is a probability of the interruption during the recording of the data to said recording medium, and

    said interruption-probability judgment-result outputting unit further includes a data-writing interruption-frequency outputting unit outputting said data-writing interruption frequency along with said result of said judgment.

#### **【0009】**

    Additionally, in the information recording and reproducing system according to the present invention, said interruption-probability judging unit further includes a relation estimating unit estimating a relation between said data-writing interruption frequency and said writing velocity,

    said interruption-probability judgment-result outputting unit further includes a relation-information outputting unit outputting relation information indicating said relation, and

    said selection-inputting function control unit further includes a writing-velocity selecting unit enabling a setting of said writing velocity and said selection via said selection inputting unit, according to said relation information output by said relation-information outputting unit.

#### **【0010】**

##### **【Mode for carrying out the Invention】**

    A description will now be given, with reference to the drawings, of embodiments according to the present invention.

FIG. 2 is a perspective view showing an outer structure of an information recording and reproducing system according to an embodiment of the present invention.

This information recording and reproducing system comprises a CD-R/RW drive 2 as an optical disk device, and a personal computer 1 as a host device. The CD-R/RW drive 2 has a just-link function according to the present invention, which is a function of resuming a recording (a data-writing) with maintaining a data-continuity. CD-R/RW data-writing software is installed in the personal computer 1. The CD-R/RW data-writing software controls the CD-R/RW drive 2. Optical-disk data-writing software is operated in the personal computer 1. The optical-disk data-writing software has functions including a function of arbitrarily issuing a function of resuming a recording with maintaining a data-continuity on/off command according to the present invention. The personal computer 1 and the CD-R/RW drive 2 are connected with each other via a general-purpose host interface such that data can be communicated with each other.

#### 【0011】

FIG. 1 is a functional block diagram showing inner functional structures of the personal computer 1 and the CD-R/RW drive 2 of the information recording and reproducing system shown in FIG. 2.

The personal computer 1 is a host device realized by a microcomputer composed of a CPU, a ROM, a RAM, etc. The personal computer 1 comprises functional units, such as an interface 10, a control-command issuing unit 11, a selection inputting unit 12, a test-writing unit 13, an interruption-probability judging unit 14, an interruption-probability judgment-result outputting unit 15, and a selection-inputting function control unit 16. Other well-known functional units included in a normal computer will neither be shown in the figures nor be described in the following description.

The CD-R/RW drive 2 is an information recording and reproducing device realized also by a microcomputer composed of a CPU, a ROM, a RAM, etc. The CD-R/RW drive 2 comprises functional units, such as an interface 20, a data-recording interruption-resumption control unit 21, and a data-recording interrupting-resuming unit 22. The CD-R/RW drive 2 writes and reads data on an optical disk (CD-R/RW) 4 which is a recording medium. Other well-known functional units will neither be shown in the figures nor be described in the following description.

#### 【0012】

The interface 10 of the personal computer 1 is connected with

the CD-R/RW drive 2 via a general-purpose host interface 3, such as an ATAPI, an IEEE, an SCSI, or a USB, so as to enable a data communication between the personal computer 1 and the CD-R/RW drive 2. The hereinbelow-described units exchange data, such as a control command, with the CD-R/RW drive 2 via the interface 10.

The control-command issuing unit 11 issues a control command to the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2 via the interface 10 and the host interface 3. The control command causes the data-recording interrupting-resuming unit 22 either to interrupt and resume a data-writing or not.

The selection inputting unit 12 supplies an arbitrary selection regarding which of the control commands is to be issued, a control command causing the data-recording interrupting-resuming unit 22 to interrupt and resume a data-writing, or a control command causing the data-recording interrupting-resuming unit 22 not to interrupt and resume a data-writing. The selection inputting unit 12 supplies the selection to the control-command issuing unit 11. Either of the control commands according to the selection is sent to the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2 via the host interface 3.

### 【0013】

The test-writing unit 13 sends an instruction to the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2 so as to cause the data-recording interrupting-resuming unit 22 of the CD-R/RW drive 2 to perform a test-writing to the optical disk 4 at a predetermined writing velocity.

According to the result of the test-writing conducted by the test-writing unit 13, the interruption-probability judging unit 14 judges whether or not there is a probability of an interruption during a data-writing to the optical disk 4.

The above-mentioned result of the test-writing is based on data transmitted from the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2.

The interruption-probability judgment-result outputting unit 15 displays the result of the judgment made by the interruption-probability judging unit 14 on a display, such as a CRT, or an LCD, or prints out the result of the judgment by using a printing device, such as a printer, not shown in the figures.

The selection-inputting function control unit 16 performs a function control enabling the selection-inputting function provided

by the selection inputting unit 12 (a control making the selection input effective or ineffective), after the interruption-probability judgment-result outputting unit 15 outputs the result of the judgment.

#### 【0014】

The interface 20 of the CD-R/RW drive 2 is connected with the personal computer 1 via the host interface 3, such as an ATAPI, an IEEE, an SCSI, or a USB, so as to enable a data communication between the personal computer 1 and the CD-R/RW drive 2. The hereinbelow-described units exchange data with the personal computer 1 via the interface 20.

The data-recording interruption-resumption control unit 21 controls the data-recording interrupting-resuming unit 22 either to interrupt and resume a data-writing or not, according to the control command received from the control-command issuing unit 11 of the personal computer 1 via the host interface 3. Additionally, the data-recording interruption-resumption control unit 21 controls the data-recording interrupting-resuming unit 22 to perform the test-writing as well as a normal data-writing/reading to/from the optical disk 4, according to instructions sent from the personal computer 1. Further, the data-recording interruption-resumption control unit 21 controls a transmission of read data and various information to the personal computer 1 via the interface 20 and the host interface 3.

#### 【0015】

Under the control of the data-recording interruption-resumption control unit 21, the data-recording interrupting-resuming unit 22 records the data transferred from the personal computer 1 via the host interface 3 on the optical disk 4 at a predetermined data-writing velocity. In a case of having interrupted the recording, the data-recording interrupting-resuming unit 22 resumes the recording by linking an end point of the write data upon the interruption with a start point of the write data upon resumption so as to maintain a continuity of the write data. Additionally, the data-recording interrupting-resuming unit 22 performs the test-writing as well as a normal data-writing/reading.

#### 【0016】

Next, a description will be given of a data-recording process in this information recording and reproducing system.

FIG. 5 is a flowchart showing the data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claims 1 to 3.

When a user operates the personal computer 1 so as to set a data-writing velocity as is the case for normal data-writing software, the control-command issuing unit 11 sets the data-writing velocity to the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2, in step 1 ("S" in the figures). In step 2, it is judged whether or not to perform a test-writing. When it is judged, according to a selection input by the user via the selection inputting unit 12, that a test-writing is not to be performed, step 8 is performed next, in which the control-command issuing unit turns on (effective) the function of resuming a recording with maintaining a data-continuity with respect to the data-recording interruption-resumption control unit. In step 9, the data-recording interruption-resumption control unit of the CD-R/RW drive controls the data-recording interrupting-resuming unit 22 to perform a data-recording at the above-mentioned data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### **【0017】**

On the other hand, when it is judged, according to the selection input by the user via the selection inputting unit, that a test-writing is to be performed, step 3 is performed next, in which the test-writing unit instructs the data-recording interruption-resumption control unit of the CD-R/RW drive to perform a test-writing. The data-recording interruption-resumption control unit controls the data-recording interrupting-resuming unit to perform the test-writing at the above-mentioned data-writing velocity to the optical disk, and sends the result of the test-writing back to the test-writing unit. The test-writing unit sends the result of the test-writing to the interruption-probability judging unit. According to the result of the test-writing, the interruption-probability judging unit judges a probability of an occurrence of a buffer underrun during a data-recording resulting from the above-mentioned data-writing velocity and other conditions, such as a data transfer rate of the personal computer, and sends the result of the judgment to the interruption-probability judgment-result outputting unit.

#### **【0018】**

In step 4, the interruption-probability judgment-result outputting unit displays the result of the judgment on the display, not shown in the figure. In step 5, it is judged whether or not the buffer underrun is to occur. In step 5, it is judged whether or not the buffer underrun is to occur. When it is judged that the buffer

underrun is not to occur, step 6 is performed next, in which a select screen is displayed on the display, not shown in the figure, for selectively inputting on/off (effective/ineffective) of the function of resuming a recording with maintaining a data-continuity, and the selection-inputting function control unit enables the above-mentioned selective on/off input via the selection inputting unit 12. In step 7, according to the selective input via the selection inputting unit, the control-command issuing unit 11 sends a control command turning on or off (effective or ineffective, respectively) the function of resuming a recording with maintaining a data-continuity to the data-recording interruption-resumption control unit. The data-recording interruption-resumption control unit of the CD-R/RW drive controls the data-recording interrupting-resuming unit to turn on or off the function of resuming a recording with maintaining a data-continuity and perform a data-recording at the above-mentioned data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### **【0019】**

When it is judged in the step 5 that the buffer underrun is to occur, step 10 is performed next, in which it is judged whether or not to reset the data-writing velocity. When it is judged, according to a selection input via the selection inputting unit that the data-writing velocity is to be reset, the step 1 is performed again, in which the user resets the data-writing velocity.

When it is judged, according to the selection input via the selection inputting unit, that the data-writing velocity is not to be reset, in the step, step 11 is performed next, in which the control-command issuing unit sends a control command turning on the function of resuming a recording with maintaining a data-continuity to the data-recording interruption-resumption control unit. The data-recording interruption-resumption control unit of the CD-R/RW drive controls the data-recording interrupting-resuming unit to turn on the function of resuming a recording with maintaining a data-continuity and perform a data-recording at the above-mentioned data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### **【0020】**

FIG. 8 is an illustration of an example of the function of resuming a recording with maintaining a data-continuity on/off select screen displayed of the above-described data-recording process when

it is judged that there is a probability of an occurrence of a buffer underrun, during the test-writing.

This select screen is displayed when a buffer underrun is to occur, according to the judgment of the data-writing software. In the screen are displayed a judgment result 50 containing a message indicating that there is a probability of an occurrence of a buffer underrun according to the result of a test-writing and a message prompting a user to either turn on the function of resuming a recording with maintaining a data-continuity or reset the data-writing velocity, a start button 51 to turn on the function of resuming a recording with maintaining a data-continuity and perform a data-writing, and a reset button 52 to reset the data-writing velocity.

#### **【0021】**

FIG. 5 is an illustration of an example of the function of resuming a recording with maintaining a data-continuity on/off select screen displayed of the above-described data-recording process when it is judged that there is not a probability of an occurrence of a buffer underrun, during the test-writing.

This select screen is displayed when a buffer underrun is not to occur, according to the judgment of the data-writing software. In the screen are displayed a judgment result 60 containing a message indicating that there is not a probability of an occurrence of a buffer underrun even without using the function of resuming a recording with maintaining a data-continuity according to the result of a test-writing, a check box 61 providing a user interface to turn on the function of resuming a recording with maintaining a data-continuity and perform a data-writing, and a start button 62 to turn off the function of resuming a recording with maintaining a data-continuity and perform a data-writing.

#### **【0022】**

As described above, according to the data-recording process performed in the information recording and reproducing system of the present embodiment, as claimed in claims 1 to 3, the system judges, based on a test-writing, whether or not the function of resuming a recording with maintaining a data-continuity is necessary, and provides information that facilitates a user's selection such that, when the function of resuming a recording with maintaining a data-continuity is not necessary, the user can arbitrarily select the function of resuming a recording with maintaining a data-continuity being turned on/off, immediately before starting a data-writing. Thus,

the information recording and reproducing system is more convenient for a user because the system can easily perform a data-writing with priority being placed on a recording quality of data to be recorded on the optical disk, according to the user's preference.

#### 【0023】

Next, a description will be given of another embodiment according to the present invention.

As shown in FIG. 3, in an information recording and reproducing system according to the present embodiment, the interruption-probability judging unit 14 of the personal computer further comprises a selection-information creating unit 30, and the interruption-probability judgment-result outputting unit further comprises a selection-information outputting unit, compared with the information recording and reproducing system shown in FIG. 1.

When it is judged that there is a probability of an interruption during a data-writing, the selection-information creating unit 30 creates appropriate selection information based on conditions, such as a data capacity to be written to the optical disk. The selection information is used to perform a data-writing without an interruption during the data-writing.

The selection-information outputting unit 31 displays the above-mentioned selection information created by the selection-information creating unit 30 as well as the above-mentioned result of the judgment on the display, or prints out the selection information and the result of the judgment by using a printer not shown in the figures.

#### 【0024】

Next, a description will be given of a data-recording process in this information recording and reproducing system.

FIG. 6 is a flowchart showing the data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claim 4.

When a user operates the personal computer 1 so as to set a data-writing velocity as is the case for normal data-writing software, the control-command issuing unit sets the data-writing velocity to the data-recording interruption-resumption control unit of the CD-R/RW drive, in step, as shown in S in the figure, 21. In step 22, it is judged whether or not to perform a test-writing. When it is judged, according to a selection input by the user via the selection inputting unit, that a test-writing is not to be performed, step 27 is performed

next, in which the control-command issuing unit turns on (effective) the function of resuming a recording with maintaining a data-continuity with respect to the data-recording interruption-resumption control unit. In step 28, the data-recording interruption-resumption control unit of the CD-R/RW drive controls the data-recording interrupting-resuming unit to perform a data-recording at the above-mentioned data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### **【0025】**

On the other hand, when it is judged, according to the selection input by the user via the selection inputting unit, that a test-writing is to be performed, step 23 is performed next, in which the test-writing unit instructs the data-recording interruption-resumption control unit of the CD-R/RW drive to perform a test-writing. The data-recording interruption-resumption control unit controls the data-recording interrupting-resuming unit to perform the test-writing at the above-mentioned data-writing velocity to the optical disk, and sends the result of the test-writing back to the test-writing unit. The test-writing unit sends the result of the test-writing to the interruption-probability judging unit. According to the result of the test-writing, the interruption-probability judging unit judges a probability of an occurrence of a buffer underrun during a data-recording resulting from the above-mentioned data-writing velocity and other conditions, such as a data transfer rate of the personal computer. Based on the result of the judgment and conditions, such as a data capacity to be written to the optical disk, the selection-information creating unit creates appropriate selection information used to perform the data-writing without an interruption, and sends the result of the judgment and the selection information to the interruption-probability judgment-result outputting unit.

#### **【0026】**

In step 24, the interruption-probability judgment-result outputting unit displays the result of the judgment on the display, and the selection-information outputting unit 31 displays the selection information on the display not shown in the figure. In step 25, a select screen is displayed on the display for selectively inputting on/off (effective/ineffective) of the function of resuming a recording with maintaining a data-continuity, and the selection-inputting function control unit 16 enables the above-mentioned selective on/off input via the selection inputting unit.

In step 26, according to the selective input via the selection inputting unit, the control-command issuing unit sends a control command turning on or off (effective or ineffective) the function of resuming a recording with maintaining a data-continuity to the data-recording interruption-resumption control unit. The data-recording interruption-resumption control unit 21 of the CD-R/RW drive controls the data-recording interrupting-resuming unit to turn on or off the function of resuming a recording with maintaining a data-continuity and perform a data-recording at the data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### **【0027】**

FIG. 10 is an illustration of an example of a function of resuming a recording with maintaining a data-continuity on/off select screen displayed along with the result of the judgment and the selection information in the above-described data-recording process.

This select screen is displayed when a buffer underrun is to occur, according to the judgment of the data-writing software. In the screen are displayed a judgment result 70 containing a message indicating that there is a probability of an occurrence of a buffer underrun according to the result of a test-writing and a message asking a user whether to turn on the function of resuming a recording with maintaining, a check boxes 71 providing a user interface to select either of "turn on the function of resuming a recording with maintaining" and "perform a data-writing at the velocity of XX" displayed as the selection information, a start button 72 to start the data-writing after the selection, and a cancel button 73 to cancel the settings in the screen.

#### **【0028】**

As described above, according to the data-recording process performed in the information recording and reproducing system of the present embodiment, as claimed in claim 4, the system estimates, based on a test-writing and such conditions as a data capacity to be written to the optical disk, selection information enabling a data-writing without necessitating the function of resuming a recording with maintaining a data-continuity, and provides a user with the selection information indicating that the data-writing can be performed at a higher writing velocity without necessitating the function of resuming a recording with maintaining when the data capacity is small, for example. Thereby, the user can arbitrarily select the function of

resuming a recording with maintaining being turned on/off or the data-recording being performed at a different writing velocity, immediately before starting the data-writing. Thus, the information recording and reproducing system is more convenient for a user because the system can easily perform a data-writing with priority being placed on a recording quality of data to be recorded on the optical disk, according to the user's preference.

### **【0029】**

Next, a description will be given of still another embodiment according to the present invention.

As shown in FIG. 4, an information recording and reproducing system according to the present embodiment has the following structural features in comparison with the information recording and reproducing system shown in FIG. 1; the interruption-probability judging unit 14 of the personal computer further comprises a data-writing interruption-frequency estimating unit 32 and a relation estimating unit 34; the interruption-probability judgment-result outputting unit 15 further comprises a data-writing interruption-frequency outputting unit 33 and a relation-information outputting unit 35; and the selection-inputting function control unit 16 further comprises a writing-velocity selecting unit 40.

When it is judged that there is a probability of an interruption during a data-writing, the data-writing interruption-frequency estimating unit 32 estimates a data-writing interruption frequency during a data-writing to the optical disk 4, based on conditions, such as a data capacity to be written to the optical disk 4, and a data transfer rate to the CD-R/RW drive 2.

### **【0030】**

The data-writing interruption-frequency outputting unit 33 displays the above-mentioned data-writing interruption frequency as well as the above-mentioned result of the judgment on the display not shown in the figure, or prints out the data-writing interruption frequency and the result of the judgment by using a printer not shown in the figures.

The relation estimating unit 34 estimates relations between the above-mentioned data-writing interruption frequency and the above-mentioned data-writing velocity.

The relation-information outputting unit 35 displays relation information indicating the above-mentioned relations on the display not shown in the figures, or prints out the relation information by

using a printer not shown in the figures.

Based on the relation information output (displayed/printed) by the relation-information outputting unit 35, the writing-velocity selecting unit 40 performs a control of causing a user to perform a setting (selection) of a data-writing velocity as well as a selective input via the selection inputting unit 12.

### 【0031】

Next, a description will be given of a data-recording process in this information recording and reproducing system.

FIG. 7 is a flowchart showing the data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claims 5 and 6.

When a user operates the personal computer 1 so as to set a data-writing velocity as is the case for normal data-writing software, the control-command issuing unit 11 sets the data-writing velocity to the data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2, in step, S as shown in the figure, 31. In step 32, it is judged whether or not to perform a test-writing. When it is judged, according to a selection input by the user via the selection inputting unit, that a test-writing is not to be performed, step 37 is performed next, in which the control-command issuing unit turns on (effective) the function of resuming a recording with maintaining a data-continuity with respect to the data-recording interruption-resumption control unit. In step 38, the data-recording interruption-resumption control unit of the CD-R/RW drive controls the data-recording interrupting-resuming unit to perform a data-recording at the above-mentioned data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

### 【0032】

On the other hand, when it is judged, according to the selection input by the user via the selection inputting unit, that a test-writing is to be performed, step 33 is performed next, in which the test-writing unit instructs the data-recording interruption-resumption control unit of the CD-R/RW drive to perform a test-writing. The data-recording interruption-resumption control unit 21 controls the data-recording interrupting-resuming unit 22 to perform the test-writing at the above-mentioned data-writing velocity to the optical disk, and sends the result of the test-writing back to the test-writing unit. The test-writing unit sends the result of the test-writing to the interruption-probability judging unit. According

to the result of the test-writing, the interruption-probability judging unit judges a probability of an occurrence of a buffer underrun during a data-recording resulting from conditions, such as a data capacity to be written to the optical disk, the above-mentioned data-writing velocity, and a data transfer rate of the personal computer, and sends the result of the judgment to the interruption-probability judgment-result outputting unit.

Additionally, the data-writing interruption-frequency estimating unit of the interruption-probability judging unit estimates a data-writing interruption frequency during a data-writing to the optical disk, based on conditions, such as a data capacity to be written to the optical disk, and a data transfer rate to the CD-R/RW drive. Further, the relation estimating unit of the interruption-probability judging unit estimates relations between the above-mentioned data-writing interruption frequency and the above-mentioned data-writing velocity.

### **【0033】**

In step 34, the data writing interruption frequency output unit creates the data writing interrupting frequency, and the relation-information outputting unit creates relation information indicating a data-writing interruption frequency for each of several data-writing velocities, based on conditions, such as a data capacity to be written to the optical disk. The interruption-probability judgment-result outputting unit synthesizes and displays the above-mentioned result of the judgment, the data-writing interruption frequency output by the data-writing interruption-frequency outputting unit, and the relation information created by the relation-information outputting unit. In step 35, a select screen including the result of the judgment and the relation information is displayed on the display not shown in the figure for selectively inputting on/off (effective/ineffective) of the function of resuming a recording with maintaining a data-continuity. The selection-inputting function control unit enables the inputting function of the selection inputting unit, and the writing-velocity selecting unit enables a selective input of the data-writing velocity via the selection inputting unit.

### **【0034】**

In step 36, according to the selective input via the selection inputting unit 12, the control-command issuing unit 11 sends a control command turning on or off (effective or ineffective) the function of

resuming a recording with maintaining a data-continuity, or sends the selected data-writing velocity, to the data-recording interruption-resumption control unit. The data-recording interruption-resumption control unit 21 of the CD-R/RW drive 2 controls the data-recording interrupting-resuming unit 22 to turn on or off the function of resuming a recording with maintaining a data-continuity and perform a data-recording at the selected data-writing velocity to the optical disk. Thereafter, this data-recording process is ended.

#### 【0035】

FIG. 11 is an illustration of an example of a function of resuming a recording with maintaining a data-continuity on/off select screen displayed along with the result of the judgment and the relation information in the above-described data-recording process.

This select screen is displayed according to the judgment of the data-writing software. In the screen are displayed a judgment result 80 containing messages, such as "data-writing capacity" and "Data-writing velocity which will not cause a buffer underrun without necessitating the function of resuming a recording with maintaining a data-continuity", as the result of the test-writing, and a check boxes 81 to "turn on the function of resuming a recording with maintaining a data-continuity" and to select from among a plurality of data-writing velocities upon performing a data-writing. A message displayed beside each of the check boxes 81 to select from among a plurality of the data-writing velocities includes a link frequency indicating a data-writing interruption frequency during a data-writing performed at each of the data-writing velocities. In the screen are also displayed a start button 82 to start the data-writing after checking either of the check boxes 81 to select from among a plurality of the data-writing velocities, and a cancel button 83 to cancel the settings in the screen.

#### 【0036】

As described above, according to the data-recording process performed in the information recording and reproducing system of the present embodiment as claimed in claims 5 and 6, the system estimates relation information indicating a link frequency for each of data-writing velocities in a case not using the function of resuming a recording with maintaining a data-continuity, according to a test-writing and such conditions as a data capacity to be written to the optical disk and a data transfer rate, and provides a user with the relation information. Thereby, the user can arbitrarily select

the function of resuming a recording with maintaining a data-continuity being turned on/off or the data-recording being performed at a selected writing velocity, immediately before starting the data-writing. Thus, the information recording and reproducing system is more convenient for a user because the system can easily perform a data-writing with priority being placed on a recording quality of data to be recorded on the optical disk, according to the user's preference.

### 【0037】

#### 【Effect of Invention】

As explained above, according to the information recording and reproducing system of the present invention, it can be easily perform a data-writing with priority being placed on a recording quality of data to be recorded on the optical disk, according to the user's preference, thereby it can be achieved the improvement for using thereof.

#### 【Brief explanation of Drawings】

【Figure 1】 a functional block diagram showing inner functional structures of a personal computer and a CD-R/RW drive of the information recording and reproducing system, shown in FIG. 2, as claimed in claim 1 to 3.

【Figure 2】 a perspective view showing an outer structure of an information recording and reproducing system according to an embodiment of the present invention.

【Figure 3】 a functional block diagram showing inner functional structures of an interruption-probability judging unit and an interruption-probability judgment-result outputting unit shown in FIG. 1, according to another embodiment of the present invention, as claimed in claim 4.

【Figure 4】 a functional block diagram showing inner functional structures of the interruption-probability judging unit, the interruption-probability judgment-result outputting unit, and a selection-inputting function control unit shown in FIG. 1, according to still another embodiment of the present invention, as claimed in claims 5 and 6.

【Figure 5】 a flowchart showing a data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claims 1 to 3.

【Figure 6】 a flowchart showing a data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claim 4.

【Figure 7】 a flowchart showing a data-recording process in the information recording and reproducing system according to the present embodiment, as claimed in claims 5 and 6.

【Figure 8】 an illustration of an example of a function of resuming a recording with maintaining a data-continuity function on/off select screen displayed when it is judged in the data-recording process shown in FIG. 5 that there is a probability of an occurrence of a buffer underrun during the test write.

【Figure 9】 an illustration of an example of a function of resuming a recording with maintaining a data-continuity function on/off select screen displayed when it is judged in the data-recording process shown in FIG. 5 that there is not a probability of an occurrence of a buffer underrun during the test write.

【Figure 10】 an illustration of an example of a function of resuming a recording with maintaining a data-continuity function on/off select screen displayed along with a judgment result and selection information in the data-recording process shown in FIG. 6.

【Figure 11】 an illustration of an example of a function of resuming a recording with maintaining a data-continuity function on/off select screen displayed along with a judgment result and selection information in the data-recording process shown in FIG. 7.

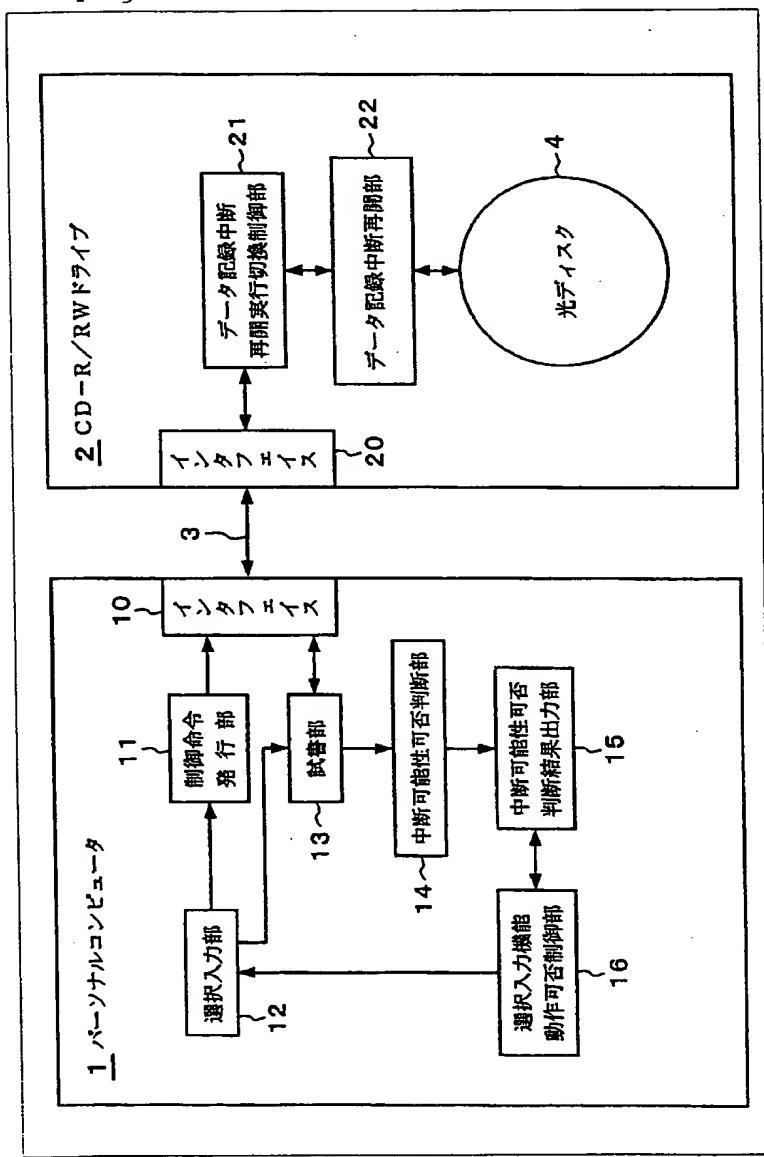
#### 【Explanation of Notations】

1	personal computer
2	CD-R/RW drive
3	host interface
4	optical disk
10, 20	interface
11	control-command issuing unit
12	selection inputting unit
13	test-writing unit
14	interruption-probability judging unit
15	interruption-probability judgment-result
outputting unit	
16	selection-inputting function control unit
21	data-recording interruption-resumption control
unit	
22	data-recording interrupting-resuming unit
30	selection-information creating unit
31	selection-information outputting unit
32	data-writing interruption-frequency estimating

unit  
33 data-writing interruption-frequency outputting  
unit  
34 relation estimating unit  
35 relation-information outputting unit  
40 writing-velocity selecting unit  
50, 60, 70, 80 judgment result  
51, 62, 72, 82 start button  
52 reset button  
61, 71, 81 check box  
73, 83 cancel button

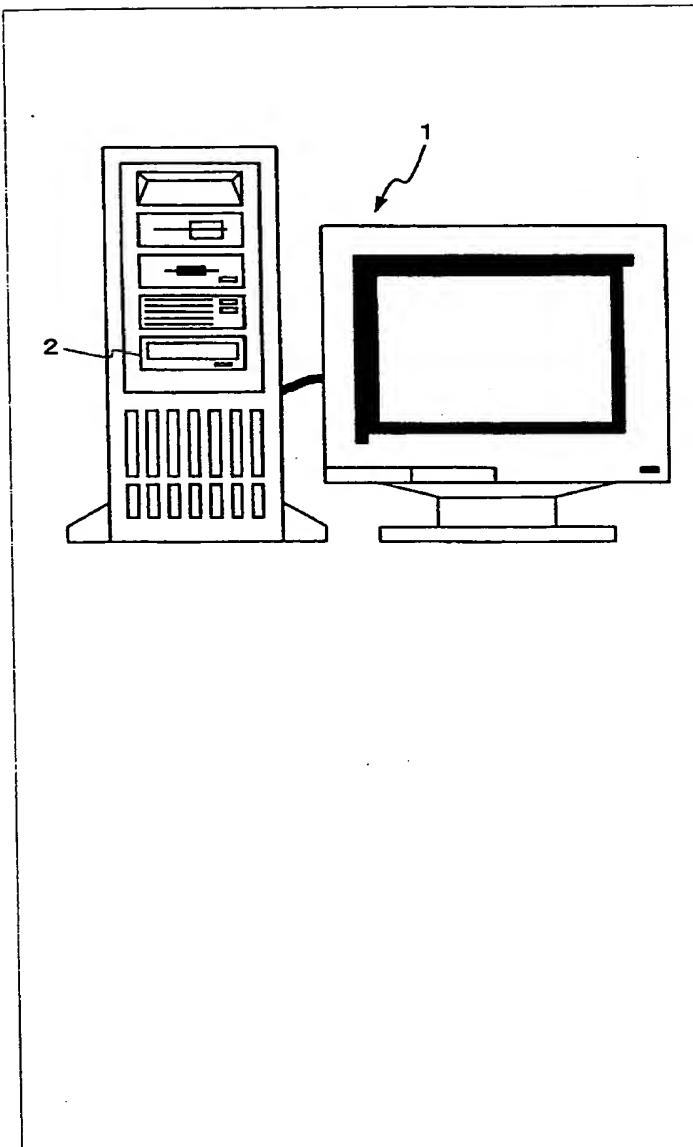
【Name of Document】  
【Figure 1】

【Drawing】

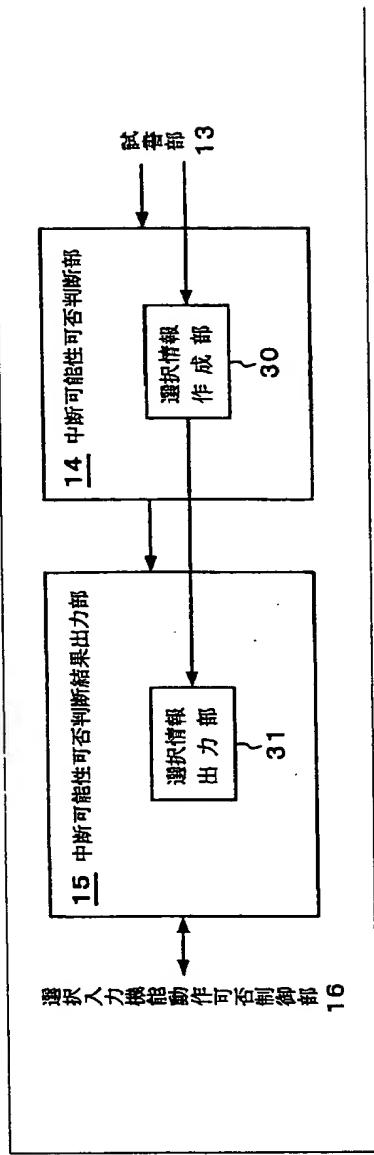


【Figure 2】

1	Personal computer
10	Interface
11	Control command issuing unit
12	Selection inputting unit
13	Test-writing unit
14	Interruption-probability judging unit
15	Interruption-probability judgment-result outputting unit
16	Selection-inputting function control unit
2	CD-R/RW drive
4	Optical disk
20	Interface
21	Data-recording interruption-resumption control unit
22	Data-recording interrupting resuming unit

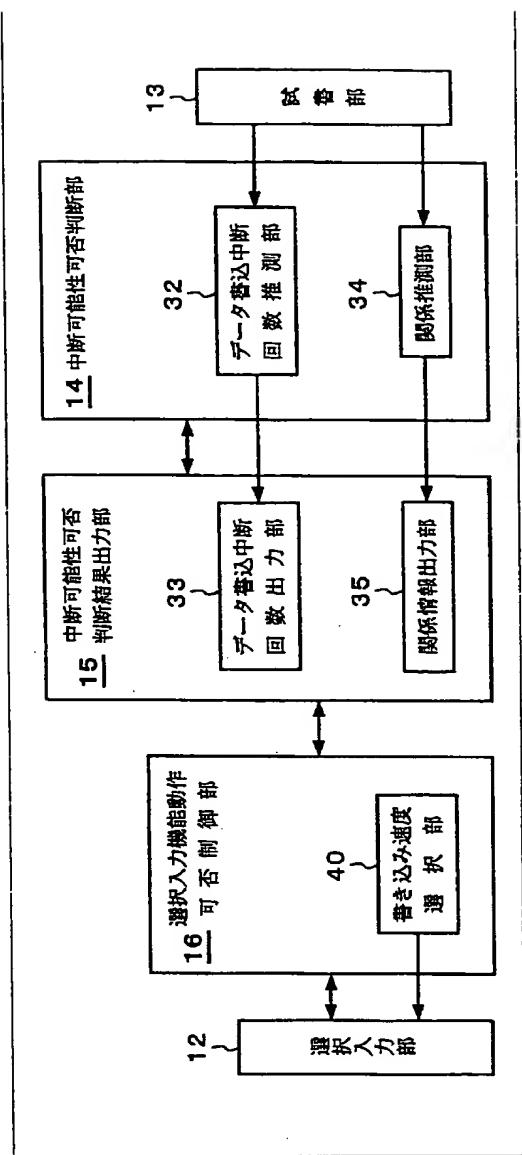


**【Figure 3】**



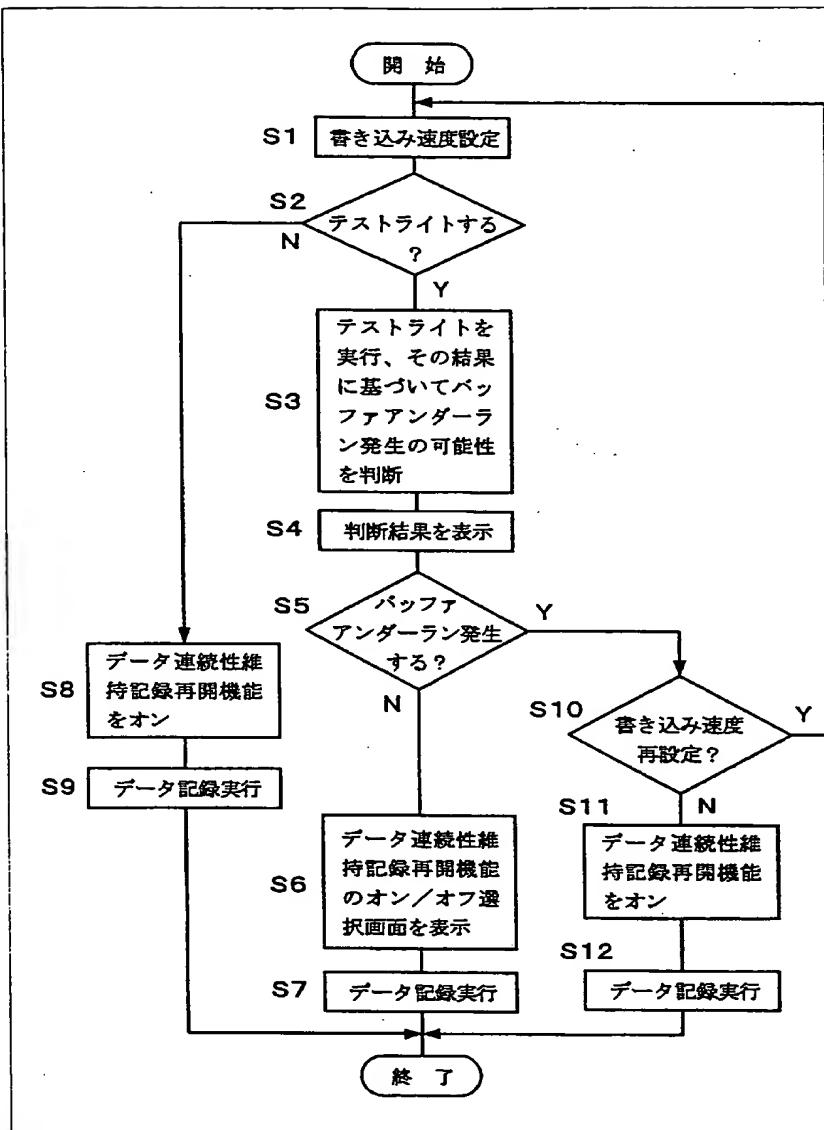
【Figure 4】

- 15 Interruption-  
probability judgment-result  
outputting unit
- 16 Selection-inputting  
function control unit
- 13 Test-writing unit
- 14 Interruption-  
probability judging unit
- 30 Selection-information  
creating unit
- 31 Selection-information  
outputting unit



【Figure 5】

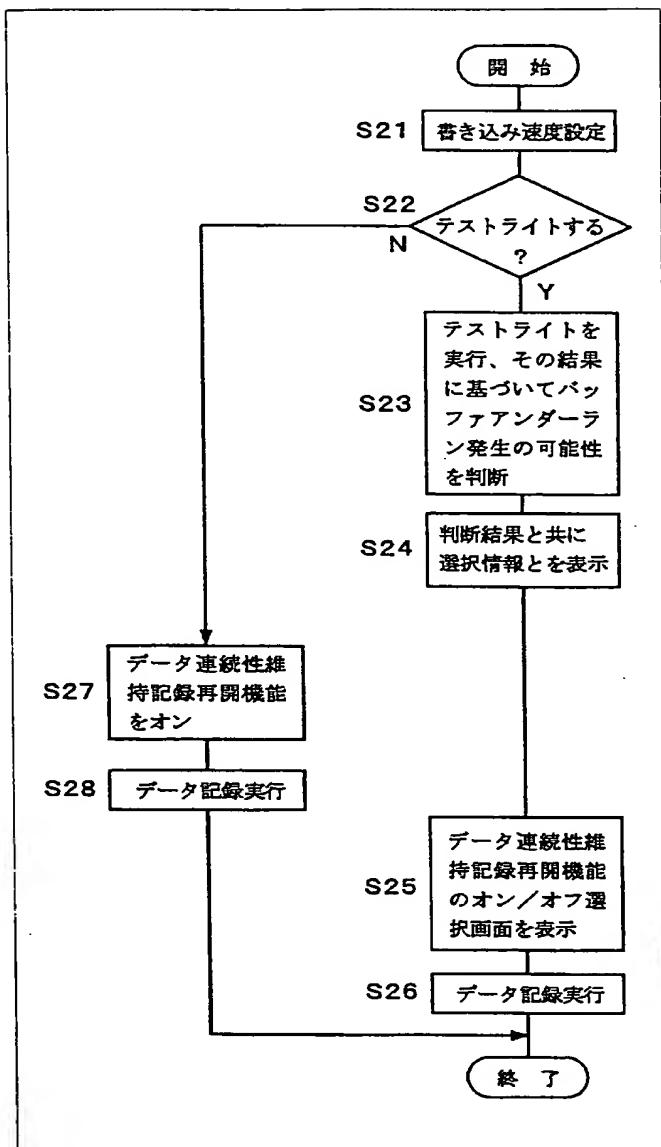
12	Selection-inputting unit	13	Test-writing unit
16	Selection-inputting function control unit	14	Interrupt-unit probability judging unit
40	Writing-velocity selecting unit	32	Data-writing interruption-frequency estimating unit
15	Interruption-unit probability judgment-result outputting unit	34	Relation estimating unit
33	Data-writing interruption-frequency outputting unit	35	Relation-information outputting unit



S1 Setting a data-writing velocity  
 S2 Judging whether or no to perform a test-writing?  
 S3 Performing a test-writing, and judging a probability of an occurrence of a buffer underrun according to the result of the test-writing  
 S4 Displaying the result of the judgment

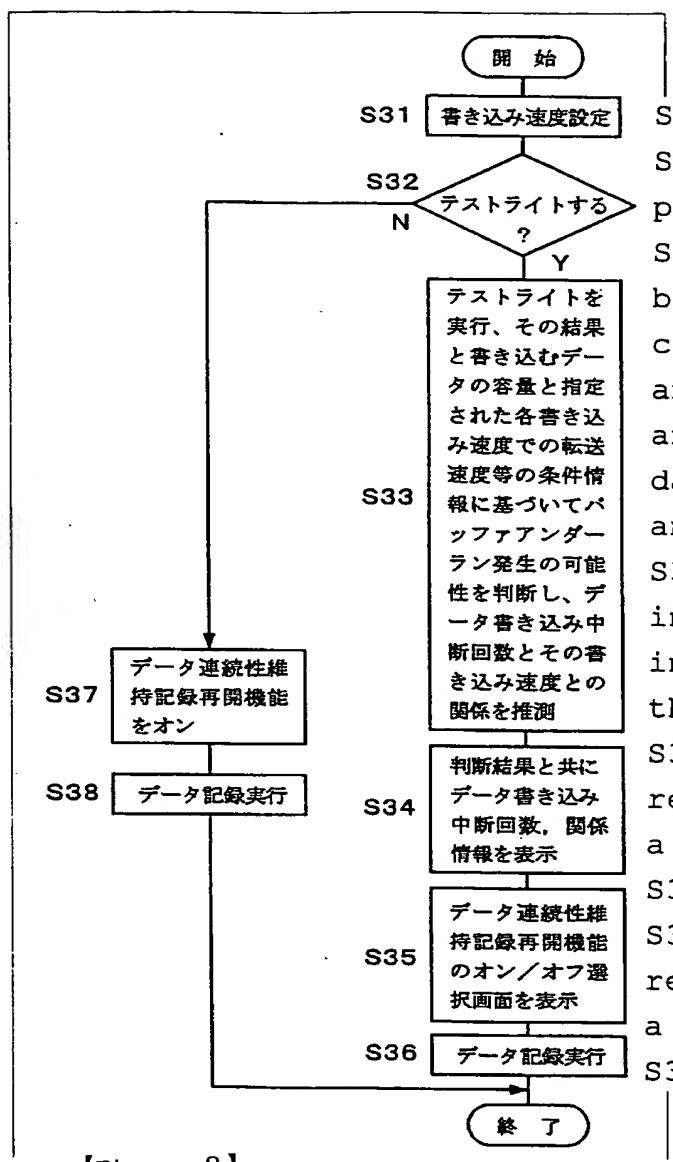
【Figure 6】

S5 Judging whether or not the buffer underrun to occur  
 S6 Performing a function of resuming a recording with maintaining a data-continuity ON/OFF select screen  
 S7 Performing a data-recording  
 S8 Turning on a function of resuming a recording with maintaining a data-continuity  
 S9 Performing a data-recording  
 S10 Judging whether or not to reset the data-writing velocity  
 S11 Turing on the function of resuming a recording with maintaining a data-continuity  
 S12 Performing a data-recording

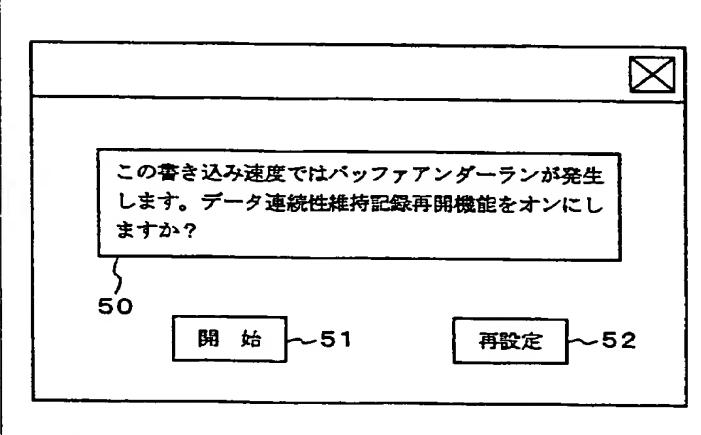


【Figure 7】

- S21 Setting a data-writing velocity
- S22 Judging whether or not to perform a test-writing?
- S23 Performing a test-writing; then, based on the result of the test-writing, judging a probability of an occurrence of a buffer underrun, and creating selection information
- S24 Displaying the selection information along with the result of the judgment
- S25 Displaying a function of resuming a recording with maintaining a data-continuity ON/OFF select screen
- S26 Performing a data-recording
- S27 Turning on a function of resuming a recording with maintaining a data-continuity
- S28 Performing a data-recording



【Figure 8】



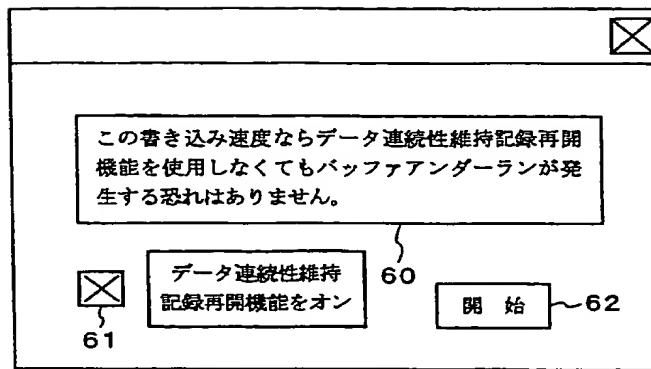
【Figure 9】

50 A buffer underrun is to occur at this data-writing velocity. Will you turn on the function of resuming a recording with maintaining a data-continuity?

51 Start

52 Reset

S31 Setting a data-writing velocity  
 S32 Judging whether or not to perform a test-writing?  
 S33 Performing a test-writing; then, based on the result thereof and other conditions, judging a probability of an occurrence of a buffer underrun, and estimating relations between a data-writing interruption frequency and the data-writing velocity  
 S34 Displaying the data-writing interruption frequency and relation information along with the result of the judgment  
 S35 Displaying a function of resuming a recording with maintaining a data-continuity ON/OFF select screen  
 S36 Performing a data-recording  
 S37 Turning on a function of resuming a recording with maintaining a data-continuity  
 S38 Performing a data-recording

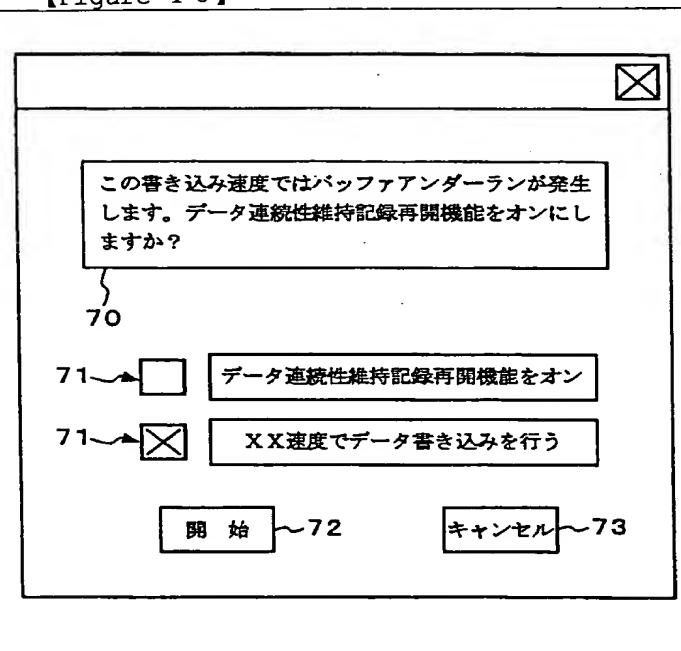


【Figure 10】

60 A buffer underrun is not to occur at this data-writing velocity without using the function of resuming a recording with maintaining a data-continuity

61 Turn on the function of resuming a recording with maintaining a data-continuity

62 Start



70 A buffer underrun is to occur at this data-writing velocity. Will you turn on the function of resuming a recording with maintaining a data-continuity?

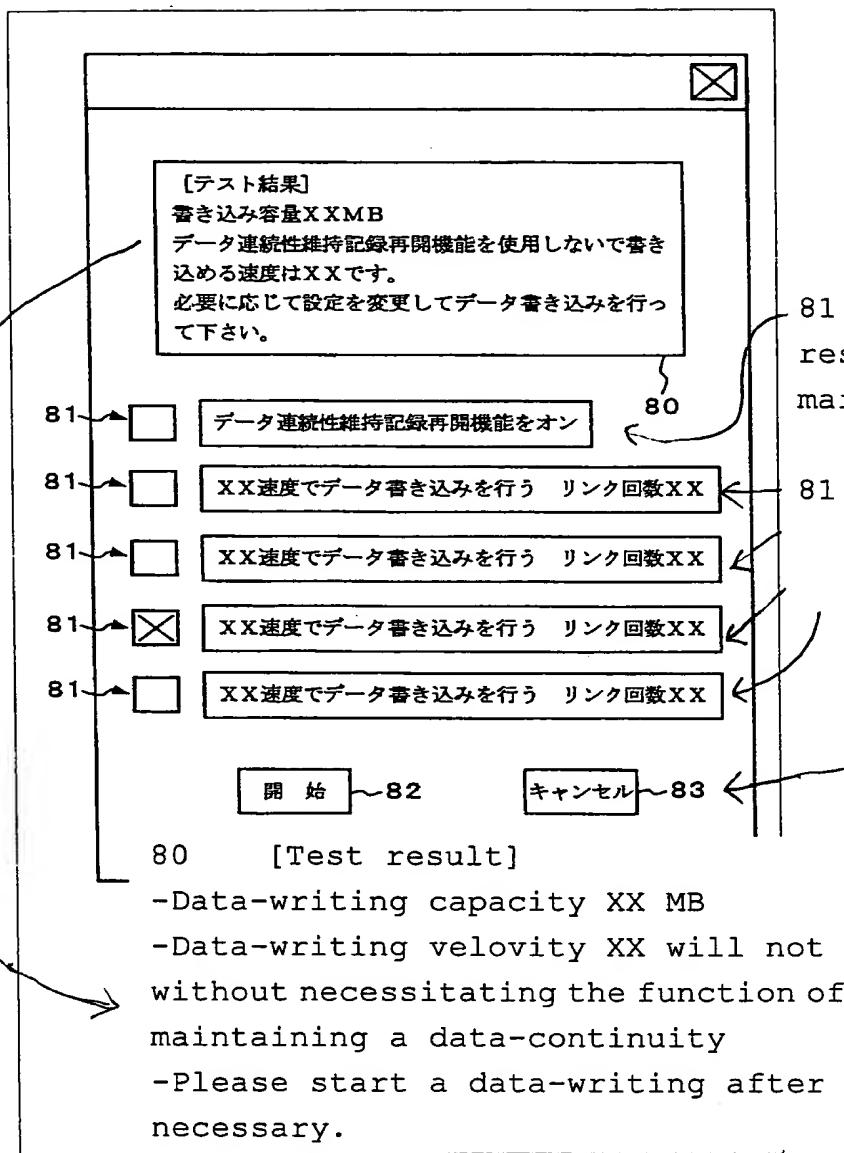
71 Turn on the function of resuming a recording with maintaining a data-continuity

71 Perform a data-writing at the velocity of XX

72 Start

73 Cancel

【Figure 11】



81 Turn on the function of resuming a recording with maintaining a data-continuity

81 Perform a data-writing at the velocity of XX: link frequency XX

82 Start

83 Cancel

**【Name of Document】**

Abstract

**【Abstracts】**

**【Problems】**

To be able to easily perform a data-writing with priority being placed on a recording quality of data to be recorded on the optical disk, according to the user's preference.

**【Means】**

A personal computer 1 issues a control command, the control command causes either or not to perform the interruption and resumption of a data recording to a CD-R/RW drive 2. The CD-R/RW drive 2 records the data transmitted from the personal computer 1 at predetermined data-writing velocity, based on the control command received from the personal computer 1. In a case of having interrupted the recording, the system control function of resuming a recording with maintaining a data-continuity either or not to perform the interruption and resumption of the recording that the recording is performed by linking an end point of data upon the interruption with a start point of the data upon the resumption so as to maintain a continuity of the data.

**【Selected Figure】** Figure 2